

Oversight News

Newsletter of the Commonwealth's Environmental Oversight of the Paducah Gaseous Diffusion Plant

Seismic Studies to Contribute to Decision on Proposed Landfill

Cleanup of the Paducah Gaseous Diffusion Plant (PGDP) could generate some three million cubic yards of waste—more than enough to fill a typical domed stadium.

As one of several disposal options for the cleanup waste, the DOE has proposed building a "CERCLA cell" at the plant. This structure would be an engineered landfill designed to contain only the material generated on site as part of the corrective action program required by the Kentucky Division of Waste Management (division). This landfill would contain the approximately 600,000 cubic yards of wastes expected to be generated in the "near term" and an additional 2.5 million cubic yards predicted for the future



Faults and other seismic features are visible along Barnes Creek in southern Illinois. Barnes Creek will be included in a seismic study into the feasibility of constructing an on-site cleanup waste landfill.

Photo courtesy of Todd Mullins, KY Division of Waste Management

demolition of the entire facility. Although the volume estimates may change, the total "footprint" of the landfill will likely remain about 110 acres. Other disposal options include shipping the waste to select out-of-state disposal facilities and using the existing C-746-U solid waste landfill.

In response to the proposal, the division and the Environmental Protection Agency (EPA) began discussing with the DOE whether any "fatal flaws" would prevent the landfill's construction. The impact a potential large-magnitude earthquake or series of earthquakes would have on the landfill emerged as the primary concern.

The PGDP is located about 75 miles from the center of one of the most seismically active areas in the world. In the winter of 1811-1812, a succession of shocks, known collectively as the New Madrid earthquake, occurred in an area of the central Mississippi Valley that included southeastern Missouri, northeastern Arkansas, and western Kentucky and Tennessee. There were at least three, and up to five, earthquakes of magnitude 8.0 or higher, along with more than 1,800 tremors between December 1811 and March 1812.

This area of seismic activity, referred to as the New Madrid Seismic Zone, is associated with a

(continued on page 2)

In this issue

Page

Many Factors Will Influence the Management of Cleanup Wastes 3

Resource Center for Energy Workers Opens in Paducah ... 4

LASAGNA™ Busy Digesting TCE Contamination 4

Outdated Facilities Face Decommissioning, Decontamination 5

(continued from page 1)

“failed rift” known as the Reelfoot Rift and represents a zone of weakness in the underlying bedrock. Recent studies have determined that large earthquakes occur in this area every 400-500 years, generally during the same period, in three distinct zones of the rift referred to as the northern, central and southern arms. The plant is located generally to the east and approximately 50 miles to the northeast of the northern arm of the rift.

Of some 4,387 seismic events recorded in or around the New Madrid Seismic Zone between 1974-1988, all but one measured less than 5.0 on the Richter scale. Most of these events were not strong enough to be felt.

The primary seismic concern with building a landfill at the site is the potential for the ground to become unstable, or “liquefy,” during a large earthquake. Liquefaction is generally limited to a depth of 40 feet and to sandy sediments, which can move dramatically under the stress of a large earthquake. Liquefaction features are common in the Mississippi River Valley, but have seldom been observed in the Ohio River Valley, especially in the region around the plant. However, to further evaluate the existence of liquefaction features, the DOE will conduct a field survey focused on a 15.5-mile radius of the plant.



The wooded area just north of Dyke Road (foreground) is part of Site 3A, the area selected for the proposed on-site landfill.

Photo courtesy of DOE

The DOE plans to conduct two fault studies in the area, each using geophysical techniques and soil borings to collect data. One study will gather information specific to the proposed landfill site, while the other will investigate regional fault characteristics.

The site-specific study at the plant will be conducted in an area of DOE property known as Site 3A, located just east of the main entrance (Hobbs Road). After considering many factors, the DOE concluded that 3A was the preferred landfill site.

The study at Site 3A will focus on determining if faults exist at that location. A (p) wave seismic reflection survey will image the bedrock and the deep unconsolidated sediments up to the top of the Porters Creek Clay formation (some 50 feet below ground surface). A horizontal shear (s) wave reflection survey may be used to image the shallow materials between the top of the Porters Creek Clay and ground surface. Any faults identified at 3A

could affect the siting of the landfill.

The regional study will occur at a series of known faults in the Barnes Creek area 11 miles northeast of the plant. The information gathered at Barnes Creek should not affect the siting of the landfill, but could affect its design specifications. Using ground penetrating radar (GPR), the study will attempt to image the known and

potential faults. Although GPR has generally been ineffective in this region, it is hoped it will be able to identify subsurface features to at least a ten-foot depth. In the Barnes Creek area, faults are exposed in the streambed, and other nearby landforms appear to have been created by faulting. These features will be further investigated by a series of test pits, along with a trench approximately 10 feet deep and 200 feet long.

The Barnes Creek study will also use Carbon-14 dating to determine the age and recurrence interval of the faulting and if the faults have moved in the last 10-12,000 years (the Holocene epoch). Since Kentucky hazardous waste regulations prohibit siting a landfill within 200 feet of a fault that has moved in Holocene time, Carbon-14 dating will also be used at Site 3A if any faults are identified at that location.

By Brian Baker, KY Division of Waste Management, Hazardous Waste Branch

Many Factors Will Influence the Management of Cleanup Wastes

The management and disposal of contaminated wastes is a major issue for the Paducah Gaseous Diffusion Plant. Cleanup of the Paducah site will create at least 1.6 million cubic yards of waste. The PGDP currently holds more contaminated scrap metal than any other facility in the Department of Energy's nationwide complex. Currently an estimated 54,000 tons of contaminated scrap are stored on site. Other remedial projects at the plant, such as burial grounds, landfills, ditches, storage of legacy waste, and the decontamination and decommissioning (D&D) of buildings, will create enormous volumes of contaminated wastes. The majority of these wastes will require disposal in a landfill capable of accepting low-level radioactive wastes or hazardous wastes. Some wastes will be eligible for industrial landfills, while other material may be recyclable.

Through numerous discussions, the Kentucky Division of Waste Management, U.S. EPA and DOE-Paducah have evaluated various options for the management of remedial wastes that will be created during the cleanup at the plant. Officials have explored options ranging from construction of an on-site disposal facility ("CERCLA cell") operating under the authority of the Federal Superfund program, to shipping all waste materials off site.

Various factors have been considered: protection of human health and the environment, the timeliness of cleanup, DOE budget constraints, and long-term stewardship concerns (long-term stewardship of a facility involves

land use controls, long-term monitoring, maintenance, and public education and awareness). After considering all these issues, regulators agreed to allow the DOE to evaluate and demonstrate the viability of an on-site waste disposal facility.

In consenting to further study of the proposed landfill, regulators imposed two conditions. First, the DOE must commit to excavating various burial grounds by stipulated deadlines prior to the division's approval of a feasibility study for the construction of a CERCLA cell. The selected burial grounds were those that would not have otherwise been excavated, due to low risks to

human health. Investigations of some of these burial grounds have shown that the majority of radionuclides within these burial grounds would tend to move very slowly through the ground. But after hundreds of years these contaminants, if left alone, will enter the groundwater and possibly surface waters. Eliminating these burial grounds and returning them to general industrial use is sometimes referred to as "footprint reduction," since it decreases the area of land dedicated to waste disposition.

Second, the division requires adequate characterization to assess the short- and long-term viability of a CERCLA cell. This evaluation would include assessments of the seismic conditions in and surrounding the plant; groundwater, surface water, and surface and subsurface soil conditions; and climatic effects. Site and regional seismic characterization began in September.

Many technical and logistical problems will require resolution before implementing a site-wide waste disposal strategy. Overall completion of cleanup at the PGDP will rely on a balance of resources and a reasonable strategy for the management of the various types of wastes created during cleanup. Nevertheless, the division is determined to expedite cleanup at the PGDP and remains committed to protecting human health and the environment.

By Tuss Taylor, KY Division of Waste Management, Hazardous Waste Branch



Much of the remediation waste will require disposal in a landfill able to accept low-level radioactive wastes or hazardous wastes.

Photo courtesy of Todd Hendricks, KY Division of Waste Management

Resource Center for Energy Workers Opens in Paducah

Just nine days after the U.S. Department of Labor began processing claims in a compensation program for injured energy workers, Labor Secretary Elaine Chao presented the program's first \$150,000 check to Paducah resident Clara Harding.

Although claims processing may take months, rather than days, to complete, "Our program is moving—people are receiving (a response)," said Stewart Tolar, director of the Department of Labor/Department of Energy Resource Center in Paducah. Tolar said that several individuals who filed claims at the Paducah center have already received benefit checks or notification that the Labor Department will recommend payment of the benefit in their cases.

In October 2000, Congress passed legislation creating a program to compensate workers who developed certain serious illnesses after working in the

Labor/Energy Resource Center

Barkley Center, Unit 125
125 Memorial Drive, Paducah
Hours: 8:30 a.m. to 5:00 p.m., Monday-Friday

The occupational illness compensation program benefits eligible DOE employees, including DOE contractors and subcontractors.

nuclear weapons industry for the Department of Energy, including its contractors and subcontractors. The Energy Employees Occupational Injury Compensation Program Act authorizes lump sum payments of \$150,000 to eligible workers or, in some cases, to their survivors. The program also has provisions to reimburse related out-of-pocket medical expenses incurred by injured workers on or after the date a claim is filed.

The resource centers provide personal assistance in completing and filing the claim forms. The claim forms collect basic factual information that allows the Labor

Department to begin adjudicating a claim. Caseworkers at the resource center can also help workers obtain medical, exposure and DOE employment records in support of the information submitted with a claim.

Besides Tolar, three full-time caseworkers, one part-time caseworker and a receptionist staff the center. Tolar and three of the caseworkers have worked at the Paducah Gaseous Diffusion Plant.

While the Labor Department administers the benefit program, the Labor and Energy Departments jointly operate the ten resource centers located nationwide near DOE facilities. The Paducah Resource Center, which opened on July 2, was the first in the nation to begin operations.

By Lauren McDonald, KY Division of Waste Management, Hazardous Waste Branch

LASAGNA™ Busy Digesting TCE Contamination

The LASAGNA™ system continues its quiet and all but unnoticed work at Solid Waste Management Unit (SWMU) 91, formerly the Cylinder Drop Test Area.

The LASAGNA™ technology, developed to remediate soils and groundwater contaminated with trichloroethene (TCE), is especially suited to sites like SWMU 91 with low-permeability (clay) soils. The process uses electrical current to move contaminants through treatment zones where the TCE can be chemically altered to nontoxic products. The treatment zones consist of iron filings injected into the contaminated soil. The technology takes its name from the way the parallel arrangement of

electrodes and treatment zones resembles layers of lasagna.

In October 2000, after almost nine months of LASAGNA™ operation, the Department of Energy conducted the first of two scheduled progress sampling events to evaluate system effectiveness. The DOE presented the results in a March 2001 report.

Eighteen soil samples were collected from five borings, all within one foot of the original baseline borings that measured pretreatment contaminant levels. Two trends were evident from analysis of the data.

First, concentrations of TCE in the deeper zones of the soil have been

significantly reduced. The most dramatic reduction occurred at a depth of 16 feet below ground surface (bgs) in sample location #6, where the TCE level dropped from 29.4 to 1.8 parts per million (ppm).

Second, similar to the Phase IIa demonstration, results seem to indicate upward mobilization of contaminants. The steepest increase occurred at a depth of 6 feet bgs at sample location #7a, where the TCE level rose from 3.4 to 552 ppm. While this upward movement is a concern, the DOE is optimistic that two system features—the vertical treatment zones and a layer of iron filings placed on top of the soils prior to

(continued on page 6)

Outdated Facilities Face Decommissioning, Decontamination

Across the country, aging Department of Energy facilities contain structures—typically buildings—that are contaminated and obsolete. Many of these structures are in a state of disrepair and contain radioactive and other dangerous constituents. The process of addressing these structures is called Decontamination and Decommissioning, or D&D. The Paducah Gaseous Diffusion Plant (PGDP) houses numerous structures that eventually will be subject to the D&D process. Of these, only the C-410 Building Complex is scheduled to undergo D&D in the near future.

Over the years the physical condition of the C-410 complex has deteriorated to the point that personnel must use special protective equipment to enter safely. Lead-based paint peels from the walls and asbestos insulation hangs from overhead pipes. The complex's roof is in a similar state of disrepair. To make matters worse, rodents and other animals have taken up residence inside the buildings.

The DOE's decision to begin early D&D of the C-410 complex was based primarily on the poor physical condition of the complex and the large quantity of contamination present. There is legitimate concern that a fire or other natural disaster might serve to spread over a large area what is currently localized contamination, potentially placing plant workers

and nearby residents at risk of exposure.

Although asbestos and lead-based paint present hazards, uranium contamination is perhaps the greatest safety concern. It is also likely that the complex contains small amounts of transuranic radioactive isotopes such as plutonium-239 and neptunium-237. Besides lead, heavy metals such as cadmium are present. These are some, but not necessarily all, of the contaminants present within the complex. There is still considerable uncertainty as

Many of these structures are in a state of disrepair.

to what other contaminants might be present.

Before the building framework can be addressed, the infrastructure—that is, all equipment and other materials that are not a part of the building structure itself—must first be removed from inside the buildings. This phase of the process will include removal of contaminated material. Once the C-410 infrastructure has been removed, the DOE will implement one of several options to be proposed for addressing the remaining structures and utilities.

The C-410 complex was constructed from the early to mid-fifties, its primary mission to produce the uranium hexafluoride (UF₆) feed material for the

enrichment process. Several adjoining structures form the complex, including the C-410/C-420 feed plant and the C-411 facility. The facilities' combined floor space exceeds 133,100 square feet.

During its operation, the C-420 facility converted uranium trioxide “yellowcake” (UO₃) to uranium tetrafluoride “green salt” (UF₄). The C-410 facility then converted the UF₄ to uranium hexafluoride gas (UF₆). Fluorine cells housed within the complex produced the fluorine needed during the conversion process. These cells were maintained at the C-411 facility. At different periods during its operational lifetime the complex reprocessed fuel removed from nuclear reactors. This material, while mostly uranium, also contained fission byproducts produced in the reactors. The complex ceased operations in 1977.

Given that there is no current or projected future use for the C-410 complex, it will likely be demolished. Throughout the process, Kentucky will be working closely with the DOE and the U.S. EPA to ensure that D&D at the C-410 complex is performed in a manner that protects human health and the environment.

By Todd Mullins, KY Division of Waste Management, Hazardous Waste Branch



Natural Resources and Environmental Protection Cabinet
Department for Environmental Protection
Division of Waste Management
Hazardous Waste Branch
14 Reilly Road
Frankfort, KY 40601

(continued from page 4)

grading—will effectively treat this contamination.

The cleanup goal is to reduce the soil concentration of TCE from an average of 84 ppm to an average of less than 5.6 ppm. The state has determined that this level in the soil will not cause groundwater at the security fence to exceed the TCE drinking water standard (five micrograms per liter).

The second progress sampling event was conducted in August 2001, with results expected in November 2001. Assuming the treatment system continues to function as in the past, the SWMU 91 remediation goals will be achieved some time between February 2002 and March 2003.

By **Brian Baker**, KY Division of Waste Management, Hazardous Waste Branch

The ***Kentucky Environmental Oversight News*** is published quarterly by the Kentucky Department for Environmental Protection's Division of Waste Management. It features information regarding environmental remediation activities at the Paducah Gaseous Diffusion Plant site and related topics. Subscriptions are free and may be requested from Lauren McDonald (newsletter editor), Hazardous Waste Branch, Division of Waste Management, 14 Reilly Road, Frankfort, KY 40601 (502) 564-6716, FAX (502) 564-2705.

Oversight News and other materials offered to the public by the Department for Environmental Protection can be provided in alternate formats to anyone with a disability. To request materials in an alternate format, contact Lauren McDonald at the address and phone numbers listed above.



Hearing or speech impaired people can contact the agency by using the Kentucky Relay Service, a toll-free telecommunications device for the deaf (TDD). For voice to TDD, call 1-800-648-6056. For TDD to voice, 1-800-646-6056.

For more information:

Contact Gaye Brewer
Division of Waste Management
P.O. Box 1410, Bldg. C-103
West Paducah, KY 42086
(270) 441-5278
FAX (270) 441-5277

Visit us at:
www.state.ky.us/nrepc/dep/waste/dwmhome.htm

*Printed on recycled paper
with state funds.*